operation, it is essential to provide logic for systematically interpreting and judging malfunction information transmitted from each one of the diagnosis targets.

One previously proposed technique for implementing such a diagnosis process is disclosed, for example, in Japanese Unexamined Patent Publication No. 7-190897 (corresponding to U.S. Patent No. 5,671,141). In this publication, there is disclosed a program architecture including an MIL controller module that illuminates the MIL when a predetermined number of malfunctions are detected.

The MIL controller module disclosed in the above publication illuminates the MIL when the predetermined number of malfunctions are detected. Furthermore, (I) malfunction judgment of the diagnosis target, (II) adjustment of the result of each malfunction judgment and (III) an MIL control operation that is carried out based on a result of the adjustment are conducted by the single MIL controller module. Thus, when specification change, such as change of a diagnosis target, takes place, a relatively large amount of time is required to modify the MIL controller module. This will be further described in the following (1)-(3).

(1) The malfunction judgment (I) of the diagnosis target cannot be a simple process of checking an operational state of the diagnosis target from time to time to judge or determine whether the diagnosis target is malfunctioning. This is due to the fact that each malfunction has a particular level. For example, in a case of "a malfunction" of an input-signal line

connected to a sensor, a temporal loose connection of, for example, a connector is called "the malfunction", and complete disconnection of the signal line is also called "the malfunction". In the former case, the connector could resume its normal function later on and thereby may not be required to be replaced. Thus, in light of the above fact, in one previously proposed technique, the temporal malfunction, such as the loose connection of the connector, is referred to as "temporarily abnormal", and the permanent malfunction, such as the complete disconnection of the signal line, is referred to as "abnormal". The malfunction information that indicates such a level of malfunction is stored in a memory. Then, the MIL control operation is carried out based on such malfunction information, so that flashing, lighting-on or lighting-off of the MIL is generally conducted based on the level of the malfunction.

Furthermore, even if the malfunction information is the same, that is, the level of the malfunction is the same, the MIL control operation may vary from one diagnosis target to another diagnosis target. That is, for example, if the diagnosis target is the important one and is determined to be temporarily abnormal, the MIL should be lighted on or flashed immediately. On the other hand, if the diagnosis target is not the important one and is determined to be temporarily abnormal, the MIL may not be lighted on or flashed immediately until the diagnosis target becomes completely abnormal.

Thus, even if the malfunction information is determined in view of the malfunction level of the diagnosis target, the

control operation of the MIL varies depending on the type of the diagnosis object. Thus, the logic for executing the adjustment (II) of the result of each malfunction judgment may be complicated.

Particularly, the previously proposed MIL controller module is constructed to carry out the series of the processes (I)-(III) at once. Thus, when anyone of the diagnosis targets is changed, the logic for executing the malfunction judgment (I) of the diagnosis target and the logic for executing the adjustment (II) of the result of the malfunction judgment need to be changed, so that a relatively large amount of time may be required to change the MIL controller module.

(2) The MIL controller module disclosed in the above publication is operated upon receiving a command from a scheduler. That is, the series of the processes (I)-(III) are carried out upon receiving the command from the scheduler.

A timing for executing the malfunction judgment (I) of the diagnosis target varies depending on the diagnosis target. For example, a malfunction of one diagnosis target may be judged at predetermined time intervals, e.g., at every 4 ms, 8 ms or 16 ms. A malfunction of another diagnosis target may be judged at predetermined crank angles (CA), e.g., at every 30 CA, 60 CA or 180 CA. Furthermore, a timing for executing the MIL control operation (III) does not coincide with the timing for executing the malfunction judgment (I) of the diagnosis target.

Since the series of the processes (I)-(III) are conducted sequentially in the previously proposed MIL controller module,